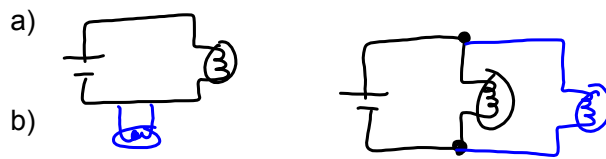
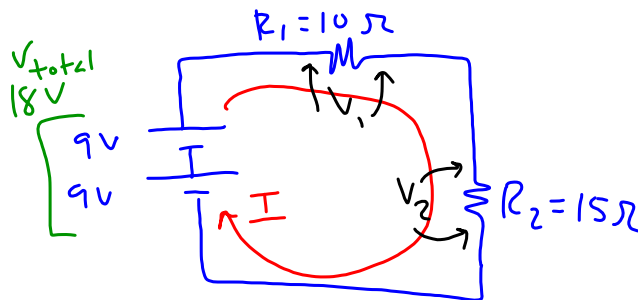


1. What happens to the brightness of each light bulb if we add another in the following circuit?



2. Draw the following circuit: Two 9 V batteries in series with a 10-ohm resistor and a 15-ohm resistor.

- a) Calculate the total resistance in the circuit.
 b) Calculate the total current in the circuit.
 c) Calculate the voltage across each resistor.



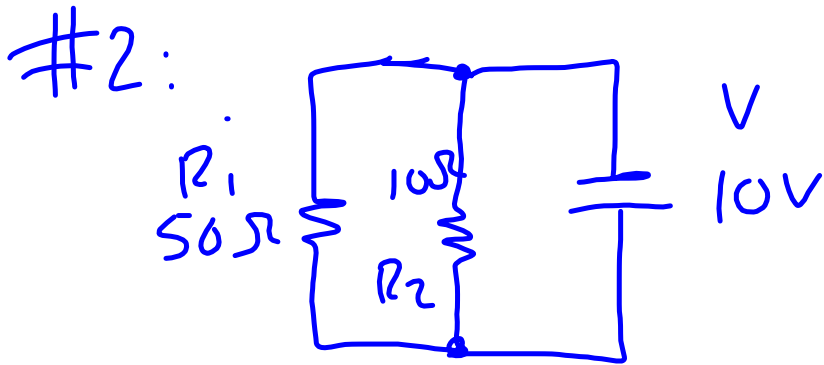
$$\begin{aligned} \text{a) } R_{\text{total}} &= R_1 + R_2 \\ &= 10\Omega + 15\Omega \\ &= 25\Omega \end{aligned}$$

$$\begin{aligned} \text{b) } V &= IR_{\text{total}} \\ I &= \frac{V_{\text{total}}}{R_{\text{total}}} \\ &= \frac{18\text{V}}{25\Omega} \\ &= 0.72\text{A} \end{aligned}$$

$$\begin{aligned} \text{c) } V_1 &= IR_1 = (0.72\text{A})(10\Omega) = 7.2\text{V} \\ V_2 &= IR_2 = (0.72\text{A})(15\Omega) = 10.8\text{V} \\ &\quad \underline{\quad\quad\quad} \\ &\quad\quad\quad 18\text{V} \end{aligned}$$

1a. Adding a lightbulb increases total resistance of circuit. This causes a decrease in current ($I = \frac{V}{R}$), which causes a decrease in brightness.
[Brightness is related to current.]

1b. The brightness would be the same in each lightbulb, because they have the same amount of current (assuming they have the same resistance).



$$I_1 = \frac{V}{R_1} = \frac{10V}{50\Omega} = 0.2A$$

$$I_2 = \frac{V}{R_2} = \frac{10V}{10\Omega} = 1.0A$$

$$\begin{aligned} I_{\text{total}} &= I_1 + I_2 \\ &= 0.2A + 1.0A \\ &= 1.2A \end{aligned}$$